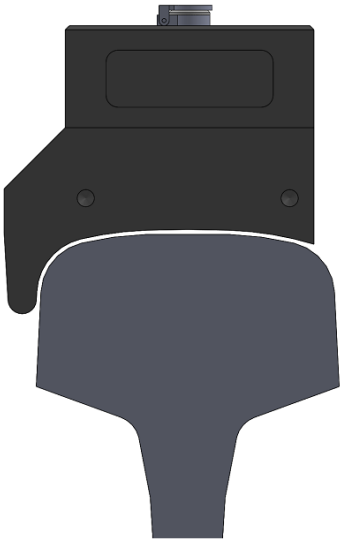
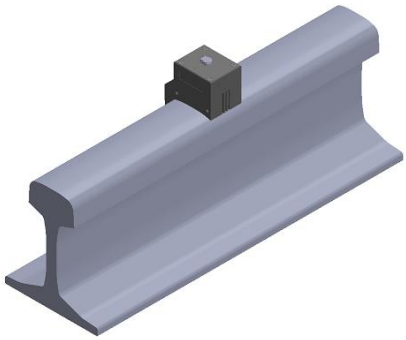
**EThер NDE Application Note: AP007**

# RAIL PROBE (WideScan)

This is a single probe that is capable of detecting orientated flaws in one pass of the rail head and producing a signal output that is related to the surface length and depth (size) of the flaw. The active face of the probe can easily be contoured to suit different rail head shape and indeed could be shaped to suit rolling stock applications.





**Application:**

Rail probes are used in conjunction with an EThер NDE portable flaw detector for rapid rail inspection, they can detect surface breaking flaws, lightness, and overcome consistency problems associated with ultrasonic couplant and higher surface speed capability.

These probes can be coupled to a manual or automatic trolley to aid inspection, I/O and data logging systems can be introduced to ensure comprehensive documentation of test results.

The Rail probe is also equally applicable to wheels and other rolling stock areas such as axles. Rail probes offers an extremely efficient and cost effective solution to detecting surface breaking flaws typical of rolling contact fatigue.

**Sensitivity to Flaws:**

The first observation that should be noted is a 150° phase separation in the eddy current signal seen when passing over a longitudinal flaw (parallel with the scan axis) compared with a transverse flaw (at right angles to the scan axis).

There are two modes of detection:

- Transverse – where the field is interrupted
- Longitudinal – where the field is distorted

For transverse flaws the signal amplitude is proportional to surface length (up to sensing length of probe 80 mm).

For longitudinal flaws the signal amplitude is proportional to flaw area (up to 14 mm length approx.).

**Effect of probe to test piece separation (lift-off):**

Increasing probe to test piece separation (termed lift-off) gives a reduced signal amplitude (sensitivity). Here the concern is not variation in the overall height (this can be maintained by contacting rolls) but the variations in profile due to wear and grinding.

The measured lift-off effect on gain is nearly identical and about 3dB per mm, hence the probe is relatively insensitive to change in profile.

**Speed of response:**

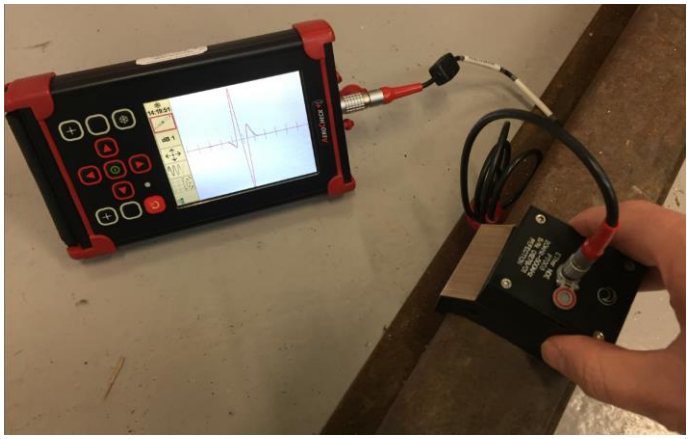
Assuming a low pass response of 2kHz gives a maximum surface speed of 32 m/s or 115 km/hr.

**Typical Probe Kit:**

Instrument: IAER002 – AeroCheck+

Probe: PT003

Lead: ALL12-L04-015R - Reflection



**Typical instrument settings and signal response:**

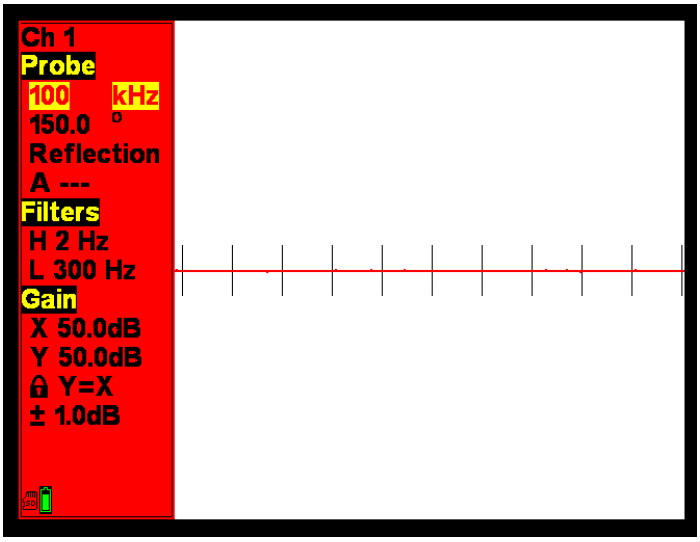
Frequency: 100kHz

Probe Mode: Reflection

Defect: 0.5mm deep transverse flaw (at right angles to the scan axis)

Shim: 1mm lift-off

Settings:

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